

## MISNAMED TASMANIAN CHITONS.

By TOM IREDALE and W. L. MAY.

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## PLATES IV AND V.

## SUMMARY.

Status of *Chiton inquinatus*, Reeve.*Endoxoplax*, gen. nov. for *Chiton inornatus*, Ten.-Woods.*Plaxiphora*, spp.*Acanthochiton*, spp.*Cryptoplax*, spp.*Ischnochiton*, spp.Recognition of *Chiton longicymba*, Blainville.*Heterozona subviridis*, n.sp.*Chiton contractus*, Reeve, is *Ischnochiton decussatus*, auctt.Recognition of *Chiton lineolatus*, Blainville, as *contractus*, auct.*Ischnochiton* (*Anisoradsia*, n.subg.) *mawlei*, n.sp.*Chiton divergens*, Reeve, is a synonym of *I. fruticosus* (Gould).*Chiton proteus*, Reeve, is the correct name for *I. divergens*, auct.*Ischnochiton milligani*, n.sp.*Ischnochiton atkinsoni*, n.sp.*Chiton ustulatus*, Reeve, is not *Ischnochiton ustulatus*, auct.*Ischnochiton torri*, n.sp. = *I. ustulatus*, auct.*Ischnoradsia evanida* (Sowerby) is not a synonym of *I. australis*, but is the name for East Tasmanian form.*Chiton cimolius*, Reeve, is distinct from *Chiton volvox*, Reeve, and is probably equal to *Lorica duniana*, Hull.*Callistochiton mawlei*, n.sp.*Sypharochiton maugeanus*, n.sp.*Rhysoplax diaphora*, n.sp.

## I. HISTORICAL NOTES.

It seems meet to anticipate the systematic correction of some misnamed Tasmanian Chitons with a few notes which may appear outside the scope of our title, but which nevertheless are the direct results of research conducted with the above sole aim.

The earliest collectors of Tasmanian Chitons appear to have been the famous French naturalists Péron and Lesueur. In 1802 the *Géographe* called at southern Tasmania, and Péron records that he met with wonderful shells on Maria Island. Our friend Mr. Chas. Hedley has sympathetically related (*Proc. Linn. Soc. N.S. Wales*, vol. xxxix, 1915, p. 727) how a comrade, Mauge, perhaps even keener than the two above-named naturalists, passed away through an effort to participate in the spoils, and was buried on the island. We have no record of any Chitons preserved from this particular locality, but it may be that Mauge's eyes feasted upon the species with which we associate his name. The following year the *Géographe* returned from Port Jackson and stayed at King Island, Bass' Straits, where a large collection of shells was made.

Péron was now the conchologist of the trip, but unfortunately, though he survived to reach Paris with his treasures, science was deprived of his personal experiences and knowledge by his early decease. Lesueur was primarily the artist, and though he edited his friend's journal he did not attempt to deal with this collection, which was deposited in the Paris Museum. Blainville, however, in the preparation of the pioneer monograph of this group published in the *Dict. Sci. Nat.*, vol. xxxvi, 1824, made good use of the material, and many species were described as collected by Péron and Lesueur from various Australian localities. The only definite citations are from King Island and King George's Sound, but unfortunately, through accidents, Péron's collections had suffered so that incorrect data were frequently ascribed to the specimens, and the correction of such errors has been made with great difficulty, as hereafter shown.

Quoy and Gaimard, twenty years after Péron and Lesueur, collected in southern Tasmania, and their great interest in this group is manifested in their beautiful plates and lucid descriptions.

The earliest British visitor who was a collector of Chitons appears to have been Dr. Sinclair, R.N., but his discoveries are peculiarly perplexing, since his shells also appear to have been mixed and we have had a great deal of trouble in clearing these up. Thus, in Dieffenbach's *Travels in New Zealand*, vol. ii, 1843, Gray described some New Zealand forms and enumerated the New Zealand molluscs. On p. 245 he recorded:—

*Acanthopleura undulatus*; *Chiton undulatus*, Q. & G., New Zealand,  
Van Diemen's Land, Dr. Sinclair, R.N.,

and p. 262:—

*Acanthochætes hookeri*, n.sp., New Zealand, Van Diemen's Land,  
Dr. Sinclair, R.N.

A few years later Reeve in the *Conch. Icon.*, section *Chiton*, included the following species as collected by Dr. Sinclair in Van Diemen's Land, viz.: *Chiton sinclairi*, Mus. Cuming, *C. inquinatus*, Mus. Brit., and *C. carinulatus*, Mus. Brit.

None of these records is reliable. The first three are undoubtedly Neozelanic, the fourth is probably so, and the last may be West American.

Reeve at the same time described *Chitonellus gunnii* from specimens forwarded by Roland Gunn, which appears to be the only contribution made to our study by that famous Tasmanian naturalist.

Joseph Milligan's name is known in this connexion through the record of some species from Flinders Island by E. A. Smith in 1884. The true facts have never been published, but it would seem that we must consider Milligan to be the first native Chiton enthusiast, for reference to the British Museum Registers and collections shows the following items: In the year 1850 Joseph Milligan presented to that institution a series of Tasmanian shells, including Chitons collected on Flinders Island, Bass' Straits. The Chitons were forty-seven in number, separated by Milligan into nineteen lots. This series has been traced in the British Museum, and we find it covers the

majority of the forms recently collected by one of us on the Furneaux Group. Thus, we note "*Ischnochiton crispus, ustulatus, contractus, decussatus, cariosus, mayii, australis, norahollandiæ, Cryptoplar gunnii, Notoplar speciosa, Acanthochiton asbestoides, and Loricæ volvox*". We have quoted these names as being in use, but we show many to be incorrect hereafter. The collection was simply placed in the drawers in the British Museum without study, but thirty-four years afterwards E. A. Smith recorded a couple of species and described one new one from Milligan's gift. One of us recorded only three years ago, and sixty-three years after Milligan's discoveries, three of the above-named species as new to Tasmania. This tardy recognition of Milligan's success in Chiton-collecting is noteworthy, since we can now accept this worker as our earliest local predecessor.

The earliest list we recollect is that of Tenison-Woods in 1877, when eleven species were included, but Woods conservatively estimated this as far too many. We wonder how he would greet our fifty to sixty species and suggestions of many more. We have not with certainty determined the modern equivalents of his eleven names.

Tate and May in 1901, mainly from collections made by the latter, were enabled to recognize twenty-four species, but these included some doubtful forms.

Torr, the most diligent Chiton collector in Australasia, explored the north-west coast, and as a result a new list was drawn up. This was published in the "Papers and Proc. Roy. Soc. Tasm." for 1912, pp. 25-40, by May and Torr, as follows:—

<i>Lepidopleurus inquinatus</i> (Reeve).	Dredged 15 f. and 9 f., South-east Coast.
<i>mattheesiannus</i> , Bednall.	One specimen, North-west Coast.
<i>columnarius</i> , Hedley & May.	One specimen, 100 f., South Coast.
<i>Caliochiton platessa</i> (Gould).	North Coast.
<i>mayi</i> , Torr.	North Coast.
<i>inornatus</i> (Ten.-Woods).	North Coast.
<i>Ischnochiton crispus</i> (Reeve).	Universal.
<i>divergens</i> (Reeve).	North Coast.
<i>contractus</i> (Reeve).	North Coast.
<i>cariosus</i> , Pilsbry.	North Coast.
<i>smaragdinus</i> (Angas).	North and East Coast.
<i>mayii</i> , Pilsbry.	South Coast.
<i>australis</i> (Sowerby).	East Coast.
<i>norahollandiæ</i> (Reeve).	North-west Coast.
<i>Callistochiton antiquus</i> (Reeve).	North Coast.
<i>Placiphora costata</i> (Blainville).	Universal.
<i>albida</i> (Blainville).	Universal.
<i>mattheesi</i> , Iredale.	North-west and East Coasts.
<i>Acanthochites asbestoides</i> (Smith).	Universal.
<i>variabilis</i> (Adams & Angas).	North-west Coast.
<i>bednalli</i> , Pilsbry.	Universal.
sp.	Five valves, 100 f. off Cape Pillar.

- Acanthochites speciosus* (H. Adams). Dredged 9 f., South-east Coast.  
*lachrymosus*, May & Torr. South-east Coast.  
*Cryptoplax striatus*, var. *gunnii*, Reeve. East and North-west Coasts.  
*Chiton jugosus*, Gould. North-west, South, and East Coasts.  
*pellis-serpentis*, Quoy & Gaimard. Universal.  
*tricostalis*, Pilsbry. North Coast.  
*quoyi*, Deshayes. South-east Coast.  
*calliozona*, Pilsbry. One valve only.  
*Loricella angasi* (Adams & Angas). North-west Coast.  
*Liolophura gaimardi*, Blainville. Recorded but doubtful.

The following species admitted in the Revised Census in 1901 were rejected, as not rediscovered or authenticated:—

- Ischnochiton fruticosus* (Gould). New South Wales.  
*carinulatus* (Reeve). Described from "Tasmania".  
*tateanus*, Bednall. South Australia.  
*Acanthochites granostratus*, Pilsbry. = *A. bednall*, Pilsbry.  
*costatus*, Adams & Angas.

An investigation of the Furneaux Group enabled one of us to add some more species, whilst also other shells found there incited a redetermination of some species, and these specimens were forwarded to England for comparison with the British Museum types, hence the present paper. The species added were (*Victorian Naturalist*, vol. xxx, 1913, p. 59) *Ischnochiton sulcatus* (Quoy and Gaimard) = *decussatus* (Reeve), *I. ustulatus* (Reeve), and *Lorica volvox* (Reeve); and the doubtful species were *Ischnochiton cariosus*, Pilsbry, and *I. contractus* (Reeve).

Continued interest through the publication of these accounts resulted in further discoveries, and in the "Papers and Proceedings Royal Society of Tasmania", 1915, pp. 78-9 and 81-2, May added *Chiton oruktus*, Manghan, *C. aureomaculatus*, Bednall & Matthews, *Acanthochiton kimberi*, Torr, and *A. rubrostratus*, Torr, all from the south-east coast, and extended the range to the south-east coasts of *Lorica volvox* (Reeve), *Callochiton inornatus* (Ten.-Woods), *C. mayi*, Torr, *Acanthochites variabilis*, Adams & Angas, and *Callistochiton antiquus* (Reeve).

This made up a total of thirty-nine species, but the collections now studied by us show at least sixty species.

We here record our thanks to a recent and most energetic field naturalist, our friend Mr. Ernest Mawle, of Port Arthur, who has submitted and presented to us splendid specimens of many species which are worthy of special note for their perfect preservation and large size. We have attached his name to two magnificent new species as a mark of our appreciation of his good work, and note that we have other new discoveries made by him now before us and anticipate many more.

It is rather difficult to fully express our thanks to our friend Dr. W. G. Torr for his generosity in presenting us with so many Tasmanian forms, the results of much labour in collection, and,



further, Iredale desires to place on record at this, the earliest, opportunity, his gratitude to Dr. Torr for the gift of an unequalled and complete series of South Australian shells, whereby definiteness has been gained in connexion with typical Adelaidean forms. We have continually referred to Torr's papers, and, though the nomenclature needs revision, these mark an epoch in the study of Australian Chitons, being based on personal experience, whilst his field notes are very valuable.

The types of the new species will be presented to the Tasmanian Museum, Hobart. These are undissected shells which have been figured as such; detail figures will be later given from dissected paratypes.

## II. SYSTEMATIC NOTES.

We preface our corrections and descriptions of new species with a few words of explanation and warning. The list given above needs extensive revision, and we have to point out one general reason. Many species were described by Reeve from the Cuming Collection and British Museum. Reeve only described and figured one specimen of each species, and very fortunately his artist painted the shell carefully. We are thus able to trace the individual which must be regarded as the type. When Pilsbry prepared his monograph he was dependent upon Carpenter's MS. notes on these shells, and Carpenter did not differentiate this figured shell. The only worker who has since determined Australian shells by direct comparison with the British Museum material also overlooked this item, which now proves important. One of us has endeavoured to fix these figured shells, and hereafter we record some results, but we would note that complications may yet occur.

The word of warning is in connexion with the description of new species from unique examples of which we do not as yet know the variation and evolution through their growth stages. Hence, while geographically species can be easily named and thus variation gauged, it is impossible to apply the knowledge so gained from one species to another case even in the same genus. The growth of sculpture and development of girdle-scales need careful investigation, for we find that the young of some species of *Ischnochiton* differ in both these items from the adult and senile phases. We have now before us almost twenty different species represented by a few specimens; most of these are very distinct, but we withhold descriptions until possessed of more material that will illustrate the growth stages. It is also necessary to use the microscope in connexion with each specimen, though we have found it an infallible law that the strange appearance of a shell is the first attraction, and that in no case are species so alike that no superficial difference is apparent at first sight.

### 1. CHITON INQUINATUS, Reeve.

This species was described from "Van Dieman's Land; Dr. Sinclair". In 1896 Sykes dissected one of the type-specimens and found it to be a *Lepidopleurus*, and recorded the species from Victoria, while

simultaneously Pilsbry and Suter added New Zealand as an additional locality, and Bednall extended the range to South Australia. In 1910 May recorded it as dredged in 9 fathoms off Pilot Station, River Derwent, and in 1912 May and Torr added "large specimens dredged, fifteen fathoms in Geographe Strait, East Coast", observing "No specimen, to our knowledge, has been taken near the shore".

Re-examination of these dredged specimens in conjunction with the type series necessitated a consideration of Neozelanic and South Australian shells. Unfortunately we have not been able to criticize Victorian examples, but we have the following facts to record. The type set are obviously "shore shells" and agree better with New Zealand specimens than with any other, but here again no certainty is possible, since they do not exactly agree, and, moreover, we have two species collected on the New Zealand littoral; we have not seen the dredged New Zealand specimens attributed to this species. We particularly note this because we have two series from Tasmania, both dredged, and these represent two species, both different from the types of *inquinatus*. Torr has also sent us two different species from South Australia, which seem to agree with the Tasmanian forms or to differ very slightly from them, we have not sufficient material to determine which. However, all those we have yet examined seem to fall into *Parachiton*, since the girdle appears to be covered with slender glassy spikes, whilst *inquinatus* and the Neozelanic shore shells have the girdle covered with small scales.

There may be a rare shore shell in Tasmania which will bear the name *inquinatus*, and there may be a shore shell in South Australia which may bear the name *liratus*, as the description given refers to a shore shell which seems to be a *Lepidopleurus*, but we have not yet traced the type.

## 2. EUDOXOPLAX, gen. nov.

This name is proposed for *Chiton inornatus*, Tenison-Woods. Pilsbry, in his Monograph, took up a manuscript description, made by Carpenter of a shell in the British Museum, under the name *Callochiton lobatus*, placing it in the subgenus *Stereochiton* from Carpenter's note, "Girdle leathery, smooth, under a lens seen to bear short minute sparsely placed hairlets." Later Pilsbry recognized this species was Tenison-Wood's species above-named, and still later sinking *Stereochiton* as a synonym of *Trachyradsia*, noted the species as *Callochiton (Trachyradsia) inornatus*, Ten.-Woods.

Recent acquisitions of many specimens show the Tasmanian shell to reach a large size, and to differ appreciably from *Callochiton* and approach very closely to *Eudoxochiton*. It differs from the latter in the very wide leathery girdle with very short thin curved few and minute little hairs, and may later be regarded as a subgenus of *Eudoxochiton*.

## 3. PLAXIPHORA IN AUSTRALIA.

Under this heading one of us gave (Proc. Malac. Soc. Lond., vol. ix, June, 1910, pp. 96-100) the results of the examination of a number of specimens, concluding as follows:—

*Plaxiphora costata* (Blainville). Specimens from Queensland, Tasmania, and South Australia.

*Plaxiphora albida* (Blainville). New South Wales, Victoria, South Australia, and Tasmania.

*Plaxiphora pateliana*, Thiele. New South Wales.

*Plaxiphora matthewsi*, Iredale. South Australia.

It was obvious from that paper that no definite result had been achieved, and other workers found great difficulty in accepting these conclusions. The writer was just as dissatisfied, and later recorded that he was still working on the matter. Herein is presented a reason for reconsidering the whole subject, but material is demanded.

It has been abundantly proved by the large collections now available that all Chitons are very local in their distribution, and this suggests the criticism of series from definite localities. With such series field notes should be considered and the variation established. Thus "Tasmania" is of little use as a locality when we know the northern shells may differ from the southern, and from the south alone we seem to have three distinct species, not counting *matthewsi*, Iredale, which is not a *Plaxiphora*, strictly speaking, at all.

Tasmanian shells have been twice named, thus: *P. albida* (Blainville), King Island; *P. tasmanica*, Thiele, new name for *Chiton glaucus*, Quoy & Gaimard, from southern Tasmania.

We have not yet examined actual topotypes, but Thiele has given figures of the type of the first-named, and good figures were given by Quoy & Gaimard as well as by Thiele of the other. As previously stated, it is hoped to settle this matter in detail later, but we call attention to it in the hopes of obtaining further co-operation, many more specimens being necessary. Thus Torr has sent us shells from St. Francis Island which he has called *costata*, publishing a note, "Mr. Gatcliffe, of Victoria, identifies this shell with *P. bednalli*, Thiele." We are inclined to agree with Gatcliffe, and the shells are certainly *not costata* (Blainville). Torr also sent us a topotype of the latter, and it seems distinct from the South Australian shell we had so identified. Further, South Australian shells do not seem to agree with Tasmanian shells determined as *albida* (Blainville), so that probably the former will bear the name of *conspersa*, Adams & Angas. A further complication exists in *Plaxiphora pateliana*, Thiele. This was described as from "Tasmania", and Iredale, probably wrongly so determined a New South Wales species.

The items calling for urgent solution are: Does *P. albida* (Blainville) exist in South Australia, and, if so, is *P. conspersa*, Adams & Angas, synonymous? Does *P. costata* (Blainville) range into South Australia and Tasmania, or is it represented by different forms? Does *P. bednalli*, Thiele, range into West Australia, and, if so, is not *P. hedleyi*, Torr, the immature shell, and also is not this the form recorded as *P. albida* (Blainville) by Thiele? Again, does *P. bednalli*, Thiele, range into Tasmania or is it there represented by a closely allied form? These questions can only be answered by the study of systematically made collections of numbers with field notes. This is necessary, as it is quite impossible to gauge the merits of the cases by

means of a few shells only. *P. matthewsi*, Iredale, is not involved in the above medley, and we think one of the other species would quickly be eliminated were collections available. We have taken the opportunity of figuring *P. matthewsi*, Iredale, from a Tasmanian specimen so determined (Pl. V, Fig. 4). When it was described the peculiar formation of the tail-valve which suggested *Frembleya* was remarked upon. Receipt of well-preserved specimens from Tasmania show that the species has no close relationship with *Frembleya*, the animal being obviously different. This is now being investigated, but in the meanwhile a nearer ally from a superficial examination might be *Loricella*. This statement should prove how extremely interesting this species is, and we hope that its exact status will be soon fixed. The valve slitting recalls that of *Callistochiton*, and we note hereafter that Thiele associated *Lorica*, *Loricella*, *Squamophora*, and *Callistochiton* together. We discuss the association later, but believe most of the resemblances of this species are simply due to convergence in development, and are not of phylogenetic import.

#### 4. ACANTHOCHITONS.

Torr, in his essay on South Australian Polyplacophora, observed, "A splendid opportunity awaits the student who will make this field a special study," and recorded sixteen species. We confirm Torr's statement, and as an aid give the following notes. First, it is now necessary for the student to collect in quantity, as we find the species difficult to delimit without long series. It will be necessary to continually use the microscope, and very many specimens must be dissected.

The difficulty of distinguishing these Chitons may be lessened by the usage of narrow generic groupings. Thus one of us advocated the usage of six generic names, viz.: *Acanthochitona*, *Cryptoconchus*, *Cryptoplax*, *Notoplax*, *Macandrellus*, and *Craspedochiton*. This was after consideration of Thiele's classification, which was based on examination of the radula as well as microscopic shell-characters, and which reads:—

"Genus *Craspedochiton* and subgenus *Thaumastochiton*.

Genus *Aristochiton*.

Genus *Cryptoconchus* with subgenus *Spongiochiton* and sections *Leptoplax* and *Notoplax*.

Genus *Acanthochites*."

If this be accepted the following alterations are necessary on nomenclatural grounds alone. Firstly, regarding the genus *Cryptoconchus* with subgenus *Notoplax* and sections *Leptoplax* and *Macandrellus*. *Notoplax* is older than *Macandrellus*, which equals *Spongiochiton* and *Loboplax*. We, however, would prefer Iredale's arrangement with the amendment that *Macandrellus* may fall as an absolute synonym of *Notoplax*. We have Tasmanian species which completely combine any superficial differences apparent in the types of the two generic groups. We would note, however, that Thiele referred the Neozelanic species "*rubiginosus*, Hutton" to *Loboplax* =

*Macandrellus*, whereas, superficially, it seemed typically a *Craspedochiton*. Again, Thiele placed the Australian *variabilis* in *Loboplax*, but we have no hesitation in disagreeing with this point. This species (there may, however, be more than one confused under the name) is of the greatest interest because it cannot be closely correlated with any other Australian shell. More study than we have yet given to it is necessary to determine the correct location of the shell, and the animal must be carefully examined. Again, it must be admitted that probably more than one generic form is confused under the name *Acanthochiton*, even as restricted above, since the "bednalli" group seems somewhat different to the "asbestosoides" group. These may, however, prove to stand in the same relationship to each other as typical *Notoplax* does to typical *Loboplax*. As one of us admitted before, this is the most difficult group in the order to satisfactorily determine, and we want much more material to work upon.

##### 5. CRYPTOPLAX.

Reeve described *Chitonellus gunnii* from Bass' Straits, Tasmania, but Pilsbry, in his Monograph, considered it a variety of *striatus*, Lamarek, even as E. A. Smith had concluded some years previously. Consequently Bednall so recorded the South Australian shells. Torr recently reverted to the name *striatus*, remarking: "*Chitonellus striatus* of Lamarek describes our South Australian species admirably . . . The breadth of the valves varies so much in *striatus* that there seems no room for var. *gunnii*." Previously, May and Torr had catalogued the Tasmanian shells as *Cryptoplax striatus* (Lamk.), var. *gunnii*. Probably Torr had overlooked an article by Pilsbry in the Proc. Malac. Soc., vol. iv, pp. 151 et seqq., March, 1901, entitled "Morphological and descriptive notes on the genus *Cryptoplax*", wherein Pilsbry clearly differentiated specifically *Cryptoplax gunnii*, Reeve, from *Cryptoplax striatus*, Lamarek. In this paper Pilsbry used spirit specimens sent by Bednall from St. Vincent's Gulf, South Australia, giving a description on p. 156 and figures on pl. xv, figs. 17-19, 24-6, to be contrasted with figs. 20-3 drawn from Port Jackson specimens of *C. striatus*, Lamarek. British Museum specimens confirmed Pilsbry's conclusion, and North Tasmanian shells generally agreed. The first Port Arthur (South Tasmania) specimen attracted attention as differing from the typical *gunnii* in being even more elongate. Mr. E. Mawle has since collected more Port Arthur specimens, and these indicate the solution of Torr's perplexity, since two very distinct species are living together in that locality. We had observed some differences in other collections, but were not certain of the exact source of the shells. Mawle's collection has placed us upon sure ground, and the additional material we are now obtaining will enable us to deal with this matter later in more detail.

In the meanwhile we can state that the two Port Arthur species are quite different superficially and in detail, and that we suggest one is the southern representative of "*striatus*", while the other



represents *gumii*. This conclusion necessitates the redetermination of South Australian shells and also West Australian ones. Torr has sent a few South Australian shells, and here again two very distinct species are confused, and it may even prove that more may be recognized. The exact application of the name *striatus* is not yet certain, for we have not ascertained the existence of the type, and the description is very inadequate and no exact locality is given, though Péron and Lesueur are cited as the collectors; this fact suggests King Island.

#### 6. ISCHNOCHITONS.

Tasmania appears to be very rich in species referred to *Ischnochiton*, s.l., but the south has developed a most wonderful fauna of large species, while the north has many Adelaidean forms. Torr recorded twenty species of *Ischnochiton* from South Australia, and the majority of these may yet be found in northern Tasmania. Pilsbry, when dealing with Port Jackson Chitons, admitted five subgenera, viz. *Ischnochiton*, s.s., *Heterozona*, *Stenochiton*, *Haploplax*, and *Ischnoradsia*. Thiele was more conservative still, for, dismissing *Haploplax* altogether, he only regarded *Stenochiton*, *Heterozona*, and *Ischnoradsia* as sections of the subgenus *Ischnochiton*. *Stenochiton* and *Ischnoradsia* are superficially so different that generic segregation is demanded. The general form of *Haploplax* differentiates this group, and the girdle-scales being very different from those of *Ischnochiton* we consider the name should have generic rank. However, we would record that neither *mayii* nor *virgatus* have any place in the group. Adult *Heterozona* is a very characteristic shell in the peculiar girdle-scaling, and we propose to use this name generically for somewhat novel reasons. Firstly, the immature *Heterozona cariosa* has the girdle-scaling normal, the scales being regular but smaller on the outer half of the girdle. This is the regular girdle-scale formation in such a species as *fruticosus*, Gould, and to some extent in the species known as "*contractus*" (recte *lineolatus*, Blainville). In the species known as "*divergens*" (recte *proteus*, Reeve) and *crispus*, Reeve, the scales are practically uniform in size to the edge of the girdle. Therefore, if *Heterozona* were to be enlarged, it might reasonably include such shells as *fruticosus*, Gould. While we do not take this step at this time we use *Heterozona* generically, as we describe a new species from southern Tasmania which is the most highly developed of the group yet known. In this the peculiar girdle covering is developed at an early age, and is most noticeable at the first glance. We would thus make use of Pilsbry's five subgenera as genera, and if these are utilized closer examination of shells becomes necessary and fewer mistakes will be made. Again, we must note that long series are necessary, as the very immature of many *Ischnochitons* are quite alike in form, lack of sculpture, and girdle-scaling. Further, the girdle-scales of juvenile specimens appreciably differ from those of the adult, even when the latter are not referable to *Heterozona*.

Since the preceding was written we have been surprised by the dissections of the new species *I. mawlei*. A peculiar and beautiful

*Ischnochiton* with extraordinary lateral sculpture was all it impressed us as. The girdle-scales were certainly slightly abnormal, in that they were more regular than those of "*contractus*" auctt., with little or no leaning to the *fruticosus* style. We found, however, that all the median valves had two, three, or four slits, instead of the single one anticipated by us. Consequently it fell into Pilsbry's subgenus *Ischnoradsia*, which in no other item did it resemble. While this proved the inadvisability of accepting Pilsbry's differential features it did not relieve us from our dilemma. We purpose having the animal investigated and will then decide as to its exact status. In the meanwhile, to fix the peculiar systematic position of the species we provide for it the new subgeneric term ANISORADSIÆ.

When Hull described *Ischnochiton falcatus* he recorded that he had received the same species from one of us under the name *I. tateanus*, concluding that an error had been made by Tate & May in 1901 when they included the latter species in the Revised Census. Confusion occurred through this note, and consequently *neither* species appeared in May & Torr's List, whereas the fact is that *both* species or their representatives *do* occur, and were dredged together. Further, either *I. falcatus* or a nearly allied shell also occurs in South Australian waters. The Tasmanian and South Australian shells known as *I. crispus* (Reeve) differ appreciably from New South Wales shells, which are typical, as shown by the types in the British Museum. The Victorian shell received as a varietal name *decorata* by Sykes, and at the present time this may be used specifically for the Victorian, Tasmanian, and South Australian form.

#### 7. CHITON LONGICYMBA, Blainville.

Blainville described this species in 1825. Quoy & Gaimard utilized this name for a common *Ischnochiton* found in Australia and New Zealand. This usage persisted until 1892, when Pilsbry separated the Australian species from the Neozelanic, retaining the above name as of Quoy & Gaimard for the latter, definitely stating that this was not Blainville's species. This disposition was accepted until one of us indicated the falsity of this procedure and definitely distinguished the Neozelanic shell with a new name. This, however, did not finish the matter, for Blainville's species still remained unrecognized. The same writer has continually endeavoured to fix this name and so effectually rid our nomenclature of an irritating item. The constant examination of the present collections has enabled us to record a favourable, though quite unanticipated, result. Blainville's description not being commonly accessible, we here transcribe it:—

"*C[hiton] longicymba*, Duf. (Blainville, Dict. Sci. Nat. (Levrault), vol. xxxvi, 1825, p. 542).

"Corps très-longé, très-étroit; limbe couvert de très-petites écailles comme farineuses; coquille très-longue, composée de huit valves grandes, croissant de la première à la dernière, convexes et parfaitement lisses; les intermédiaires avec des aires latérales larges, distinctes par une saillie anguleuse; couleur générale d'un vert brunâtre, varié ou panaché de petites taches blanches, plus larges sur

la ligne dorsale. Cette jolie espèce existe dans la collection du Muséum; elle provient des rivages de l'île King."

The recognition of this species is very easy when the keynote is touched. Hitherto we have always been searching in the wrong place, looking at *Ischnochitons* with sculpture, whereas Blainville wrote "valves . . . parfaitement lisses".

Rochebrune described a large number of Chitons in the Paris Museum, generally hiding every clue to their identity under a peculiarly false generic location. Thus he described *Schizochiton nympa* (Bull. Soc. Philom. Paris, ser. VII, vol. VIII, p. 36, 1884) from King Island, collected by Péron & Lesueur. No one could possibly be expected to guess that so far from being a *Schizochiton*, this species was exactly the opposite in every generic feature, being a *Stenochiton*. Yet Thiele, from an examination of Rochebrune's type, has showed this and given figures to support his conclusions. In a similar case one of us showed that Rochebrune had redescribed the type of a species named by Quoy & Gaimard, and this enabled us to reconcile the loss of the type of *C. longicymba*, Blainville, with the presence of *Schizochiton nympa*, Rochebrune.

From Thiele's description and figures there is certainty that Rochebrune renamed the Blainvillean species, and that *Chiton longicymba*, Blainville, is a *Stenochiton*. Thiele does not definitely make this a synonym of *Stenochiton juloides*, H. Adams & Angus, and until King Island specimens are again collected we prefer to allow *Stenochiton longicymba* (Blainville) as a separate species. Blainville definitely named four species as coming from King Island, viz. *C. lineolatus*, *C. longicymba*, *C. hirtosus*, and *C. albidus*. Thiele disposed of the last two, and we now recognize the two first-named. Thus *C. lineolatus* is later shown to be the species known as "*I. contractus*, Reeve", but which is not Reeve's species. The status of *C. longicymba* has just been discussed, while *C. albidus* from examination of the type-specimen still existing must be used for one of the common species of *Plaxiphora*.

Though Thiele recorded that *C. hirtosus* was based on the shell later described by Quoy & Gaimard as *C. georgianus*, from King George's Sound, and therefore the locality "King Island" was erroneous, he did not use it. We had referred the species to the genus *Sclerochiton*, though Thiele selected *Liolophura*, but here we simply note that *Sclerochiton* is untenable, the name being preoccupied, and for the Chiton so named, *Squamopleura*, Nierstrasz, seems available: of which more at a later opportunity.

#### 8. HETEROZONA SUBVIRIDIS, n.sp. Pl. IV, Fig. 2.

Shell of full size for the genus, elliptical, valves low, semi-carinate, keel often obsolete, side slopes arched, valves not beaked. Colour varied, generally of shades of blue-green with lighter stripes and mottling; many specimens show a dark dorsal stripe succeeded on each side by whitish stripes; some specimens combine with the bluish shell a beautiful red-brown girdle, others even a golden girdle, though usually the girdle is darker blue-green. The characteristic

coloration has suggested the specific name, but some colour-aberrations occur in which the green is lacking, being pale cream splashed with white and orange, though green even here sometimes recurs. The following description of the sculpture is drawn up from a perfectly normal specimen of small size selected as the type.

Anterior valve regularly radially ribbed with about fifty flattened ribs. Median valves have six to eight similar ribs on the lateral areas; the pleural areas have a few longitudinal wrinkled threads near outer edge of the pleura, the rest of the pleura and jugum covered with fine zigzag wrinkled lines. Posterior valve regular and normal; mucro elevated about anterior third; sculpture of posterior half like that of the anterior valve; anterior portion sculptured like the pleura. Variation in the sculpture occurs according to age in that the ribbing on the anterior valve and lateral areas of median valves increases through divarication and also tends to degenerate into nodules through the intersection of the concentric growth-lines. The posterior area of the tail-valve shows this more strongly, appearing in some cases coarsely nodulose. Further with age, the pleural sculpture becomes finer and the zigzags predominate. Girdle-scales distinctive; near the shell small pointed or tending to mucronate scales bearing striæ, and comparatively regular for about half the width of the rather broad girdle; the outer half covered with minute scales, irregular and somewhat varying in size.

Length of type 30 mm., breadth 16 mm. Dried shell. Length of largest specimen (dried) 49 mm., breadth 24 mm.

The series examined shows two phases, a lower broader shell and a higher narrower shell; they are certainly conspecific as far as can be determined at the present time, and the only suggestion we can make is that the differences may be sexual. This suggestion is being investigated as it may explain the discrepancies observed in other cases. The internal structure is quite normal, the coloration varying slightly as the outer coloration varies.

Type from Port Arthur, southern Tasmania, collected by E. Mawle. Range, east and south coasts of Tasmania. Swansea, Kelvedon (W. L. May); Port Arthur (W. Torr, W. L. May, E. Mawle).

#### 9. *CHITON CONTRACTUS*, Reeve.

The locality given when this species was described was "New Zealand". When Pilsbry dealt with it (*Man. Conch.*, vol. xiv, 1892, p. 93) he did not comment upon this, but simply gave "Tasmania (Mus. Cuming.)". This was taken from Carpenter's Manuscript, the quotation reading, "There are 3 specimens in the Cuming collection, from Tasmania, and two on the same tablet which are really an intermediate variety of *I. castus*." As synonyms, also following Carpenter, Pilsbry added *Chiton decussatus*, Reeve, *Chiton castus*, Reeve, and *Lepidopleurus speciosus*, H. Ad. & Angas. Later, in the *Nautilus*, vol. viii, p. 129, March, 1895, Pilsbry recorded, "By the study of many specimens received from Messrs. Bednall & Cox, I find that two species were 'lumped' under the name *Ischnochiton contractus*. (1) *I. decussatus*, Reeve, of which *castus*, Reeve, and

*speciosus*, Ad. & Ang., are synonyms, and (2) *contractus*, Reeve, of which Mr. Sykes considers *pallidus*, Reeve, a synonym." This conclusion was accepted by Bednall, though he observed he was not satisfied. Confusion of more than one species under the name *contractus* in Tasmania urged reconsideration from first principles, when it was found that the description of *contractus* was only applicable to the shell known as *decussatus*, specimens being available that agreed absolutely with Reeve's figure and description. Reeve wrote, "terminal valves and lateral areas of the rest concentrically granulated, granules solitary." This is quite definite and sufficient to fix the species, and when this is accepted the exact shape and coloration are seen to agree. Search in the British Museum showed that the description and figure had been taken from a specimen of *decussatus* on the same tablet as specimens of "*contractus* auctt.", and this had apparently been selected as being the most perfect. Consequently the name *contractus* undoubtedly refers to the species known as *decussatus*, and the synonymy given in the Man. Conch by Pilsbry is exact. We had drawn up a description of "*contractus* auctt." when we recognized that the description of *lineolatus* given by Blainville was absolutely applicable. We reproduce the latter: "*C*[*hiton*] *lineolatus* (Blainville), Dict. Sci. Nat. (Levrault), vol. xxxvi, 1825, p. 541). Coll. du Mus.

"Corps ovale, assez allongé; les aires laterales des valves intermédiaires moins distinctes que dans les espèces précédentes, et offrant des stries nombreuses sur les bords; les écailles du limbe très-petites; les dents des lames d'insertion non pectinées; couleur variée de petites taches longitudinales brunes sur un fond jaunâtre. Cette espèce, assez rapprochée de l'oscabrion allongé, a été rapportée de l'île King par M. Péron et Lesueur."

Sykes has recorded *C. pallidus*, Reeve, as a synonym, but the description is of a *smooth* shell of unknown locality. The tablet bearing the name has specimens of "*contractus*" upon it, as Sykes recognized, but the particular shell figured and described by Reeve is there also; it is a *smooth* shell, due to extraordinary wear, and differs in shape and is quite indeterminable, but *textilis* is suggested, and it very probably is *not* Australian. We give the synonymy of the two species as we now make it.

*Ischnochiton contractus* (Reeve).

*Chiton contractus*, Reeve, 1847 = *C. sulcatus*, Quoy & Gaimard, 1834, not of Wood, 1815 = *C. decussatus*, Reeve, 1847 = *C. castus*, Reeve, 1847 = *Lepidopleurus speciosus*, H. Adams & Angus, 1864 = *Gymnoplax urvillei*, Rochebrune, 1881.

Range: Adelaidean Region from Flinders Island, Bass' Straits, to Rottneest Island, West Australia (W. Torr).

Note.—One of us observed that specimens in the British Museum from West Australia appeared separable. We have not seen any more shells from that locality, but Torr has again recorded it. We here note that should the West Australian form be distinguished it



will bear the name *urvillei*, Rochebrune, given to the shell collected by Quoy & Gaimard in King George's Sound, West Australia.

*Ischnochiton lineolatus* (Blainville). Pl. IV, Fig. 1.

*Ischnochiton contractus*, Pilsbry, 1895 (not of Reeve, 1847), and of all recent writers. A good description was published by Pilsbry in the Manual, extracted from Carpenter's MS., but no figure has yet appeared. We remedy this latter point, but do not give any further description, since the shell we figure is well known, and complications occur in specimens from southern Tasmania which we have not yet completely cleared up.

The typical form is very common in South Australian waters, where little variation exists. One of us collected it in the Flinders Group, and odd specimens with the same distinctive coloration have been taken in southern Tasmania.

"*I. contractus*" must now be entirely omitted from the New Zealand fauna.

10. ISCHNOCHITON (ANISORADIA, n.subg.) MAWLEI, n.sp. Pl. IV, Fig. 4.

Shell of full size for the genus, elongate elliptical, valves round-backed, low, not keeled nor beaked. Colour uniform pale yellow. The following description of the sculpture is drawn up from a small normal specimen selected as type.

Anterior valve sculptured, with fifty to sixty low radials, which are curved, straggling, convergent, and more or less undefined, so that scarcely any one can be traced from apex to edge. Median valves show the same sculpture on the lateral areas, but more irregular development still is here noticeable. The pleural areas are sculptured at the sides with irregular longitudinal threads, more or less wavy, which become obsolete towards the jugum, the dorsal area being covered with fine zigzag scratches. Tail-valve large with mucro elevated at about the anterior third, posterior slope straight. Posterior area sculptured like the anterior valve, but more roughly, separated lozenges commonly occurring; anterior sculpture like that of pleura of median valves. Variation in sculpture is slight, age developing more radials on anterior valve and lateral areas of median valves, while concentric growth-lines become more prominent and tend to form lozenges on these areas, the posterior area of tail-valve generally showing this lozenge formation more boldly. Interior coloration pure white. In young shells both the tegmentum and articulamentum are brittle. The sutural laminae and teeth are typically Ischnoid, but the latter are very short. In the anterior valve twenty slits were counted in a senile shell, twenty-five in a young one, the teeth irregular in shape. In the posterior valve eighteen irregular slits were noted in the senile shell, eighteen regular ones in the young one. In the median valves the sinus is broad, about one-third the breadth of the valve, the sutural laminae are long and evenly shaped; the lateral teeth are very short, exceeded by the tegmentum, and two, three, or four slits occur. The external appearance of the shell is distinctive, but detail figures of the valves will be given later. Girdle

broad, covered with regular imbricating small scales; in the young shell these are oval, sub-erect, with ten to twelve deep grooves, the apex smooth. Adjacent to the shell these are longer, narrower, and more erect. Small squarish granules adorn the edge. In a senile shell the scales are all more erect and more deeply grooved, while they are more irregular in shape. Length of type (dried shell) 34 mm., breadth 18 mm. Collected by E. Mawle at Port Arthur, South Tasmania.

Range: south coast of Tasmania.

This distinctive species cannot be confused with any other Australian shell, differing as it does in shape, colour, sculpture, and internal features. It is a very fine discovery, as it grows to 51 mm.  $\times$  24 mm. in the dried specimen. We have already indicated that its relationships are obscure and its range is very restricted so far as at present known, for such a conspicuous shell could not escape notice by collectors as keen as those of Victoria and South Australia.

#### 11. CHITON DIVERGENS, Reeve.

Reeve's description and figure were not carefully considered by Pilsbry when he separated *divergens*, Reeve, from *fruticosus*, Gould, and made *Chiton proteus*, Reeve, synonymous with the former. Pilsbry wrote "Girdle covered with large scales", and remarked, "*I. divergens* has been erroneously united to *fruticosus* by Angas and by Haddon." Angas and Haddon were, however, quite right, as the figure shows, and the description "ligament horny, very finely granulosly coriaceous" is very definite. Reeve's diagnosis of *Chiton proteus* is a perfect description of the shell Pilsbry considered "*divergens*". Tasmanian shells recorded under the latter name do not agree with specimens of *proteus* and are here distinguished. We may note that in the British Museum the shell apparently figured by Reeve as *C. divergens* is on a tablet now labelled *fruticosus* (quite correctly), while the type of *proteus* appears to be on a tablet labelled "*divergens*".

#### 12. ISCHNOCHITON MILLIGANI, n.sp. Pl. V, Fig. 2.

Shell of full size for the genus, narrowly elongate, not appreciably tapering at the ends, elevated, gothic arched, valves not beaked nor keeled. Colour varied: greenish of dull shades longitudinally streaked with darker. Anterior valve small radially, closely ribbed, with numerous low riblets, often divaricating, forty to sixty or more according to size. Median valves deep; lateral areas radially ribbed as anterior valve, eight to twelve ribs being counted; ribs low and close together. Pleura finely ridged at sides, ridges straight, succeeded on jugum by finer sculpture which is sometimes zigzag in character. Tail-valve large, mucro elevated at anterior third, posterior slope slightly concave; sculpture of posterior area as of anterior valve and anterior portion sculptured as pleural areas. Girdle-scales large, oval, and very regular, deeply grooved with eight to ten grooves. Interior with red markings, a red horseshoe clearly seen in tail-valve; slitting regularly Ischnoid in character, head-valve in young shell

having 13 slits, old shell 9 slits, median valve 1 slit, tail-valve in young shell 13 slits, in old shell 11 slits.

Type from Port Arthur, southern Tasmania, collected by E. Mawle. Length 41, breadth 19 mm. Largest shell: length 59, breadth 27 mm.

Range: coasts of Tasmania.

This species differs from *I. proteus*, Reeve, in the finer sculpture of the terminal valves and lateral areas of the median valves, while the pleura shows much coarser sculpture. It grows to a much larger size, and the scales of the girdle are comparatively smaller. Compared with a typical specimen of *proteus* of the same size, the anterior valves show 40 ribs, the laterals 6-8, the posterior 40 ribs, as against anterior 35, the laterals 4-7, the posterior 28-30 for *proteus* (Pl. V, Fig. 2a'''). The figures will show the differences, which become emphasized as larger specimens are examined.

### 13. ISCHNOCHITON ATKINSONI, n.sp. Pl. IV, Fig. 3.

Shell small, elongate oval, elevated, round-backed, valves not beaked. Colour uniform buff. Anterior valve coarsely quineuncially punctate, though obscure radials can be distinguished; the type-specimen figured is half-grown only, since the valves become eroded and brittle at a very early stage. In the senile shell obscure radials predominate on the anterior valve. Median valves have the pleural areas coarsely quineuncially pustulose, the pustules round, flat-topped, and finer on the jugum, which is always much eroded in senile shells. The lateral areas are well elevated, pustulose only in the adult, coarse, nodulous radials being developed with age, that are, however, dominated by the concentric growth-lines so that they appear as if concentrically granulose. The posterior valve is pustulose in the immature stage, which first shows the development of stronger sculpture. In the senile shell the mucro is elevated and central, the posterior slope slightly convex, sculptured with apparently elongate nodules, caused by the intersection of the radials with the growth-lines. Girdle-scales regular, very small, and finely striate. Internal coloration white; slits normally Ischnoid, nine in anterior valve, one in median valves on each side, eleven in posterior valve.

Type collected by Mr. E. D. Atkinson, J.P., at Sulphur Creek, northern Tasmania.

Length 8, breadth 4.5 mm. Senile shell: length 13, breadth 7 mm. Dried shells.

Range: northern Tasmania. Also collected by Dr. Torr.

The minute striated scales of the girdle at once distinguished this small species from the immature of *I. decoratus* (Sykes), and there is at present no other species with which it can be confused. It suggested "*gryei*" recorded by Dr. Torr from South Australia, but we find it quite distinct, as will later be shown.

### 14. CHITON USULATUS, Reeve.

Angas, in 1867, recorded *Lepidopleurus ustulatus* (Reeve) from Port Jackson. Pilsbry (Proc. Acad. Nat. Sci., 1894, p. 70, footnote) commented "*Ischnochiton ustulatus*, Reeve, occurs abundantly in South Australia, but nothing I have seen from Port Jackson

corresponds to this species". Bednall (Proc. Malac. Soc., vol. ii, April, 1897, p. 144) then recorded a species under this name, giving a very fine word-picture of the shell, and observing, "Recorded by him [Angas] from New South Wales, where it does not appear to occur. I have received specimens of *I. divergens* (= *proteus*) under this name." Bednall's species does not agree with the type of Reeve's species, but is a very distinct unnamed shell. We would note that Sykes (Proc. Malac. Soc., vol. ii, July, 1896, p. 88) also recorded *Ischnochiton ustulatus* (Reeve) from Port Phillip. We have not seen the shells so named, but they may have been the true *ustulatus*, since there are shells in the British Museum dredged in Port Phillip which agree very closely with the type lot of *ustulatus*, Reeve.

15. *ISCHNOCHITON TORRI*, n.sp. Pl. V, Fig. 3.

*Ischnochiton ustulatus*, Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, p. 70, footnote, and of Bednall, Torr, May, and Thiele, but not *Chiton ustulatus*, Reeve.

Shell of full size, for the genus narrowly elongate, girdle broad, elevated, round-backed, valves not beaked. Colour red brown, longitudinally striped with cream, stripes more prominent on the dorsal area, lacking on head-valve. Anterior valve very finely radially ribbed, about fifty being counted on normal specimen. Median valves, with lateral areas strongly elevated, similarly sculptured, but sculpture commonly tending to elongate lozenge shapes through growth-lines. Pleural areas very finely quincuncially punctate, somewhat linear towards edges, even fine on the jugum. Tail-valve with mucro elevate, ante-central, posterior slope a little concave; the posterior sculpture like that of anterior valve, but much more cut into lozenges by the concentric growth-lines. Internal features normal. Girdle very broad, covered with microscopic scales, not distinguishable with an ordinary lens. This is diagnostic. Under the microscope the scales are seen to be elongate ovals, a little variable in size, flattened, and closely imbricating; they average about a tenth of a millimetre long, and are finely striated with about twelve striæ.

Type from Barren Island, Flinders Group, collected by W. L. May. Length 29, breadth 14 mm.

Range: Adelaidean region from Flinders Group to West Australia, recorded by Torr and Thiele.

This very distinct species stands quite alone, not only in shape, coloration, and sculpture, but in its microscopic girdle-scales. We have given a section of the girdle of one of the type series of *Chiton ustulatus*, Reeve, for comparison, drawn from the specimens in the British Museum (Pl. V, Fig. 3a"). We have not yet recognized Reeve's species, though it certainly seems Australian.

16. *ISCHNORADSLIA EVANIDA* (Sowerby).

In the "Mag. Nat. Hist. (Charlesworth)", vol. iv, June, 1840, Sowerby described (p. 290) *Chiton australis* (Conch. Illus., fig. 46), Australia, and (p. 291) *Chiton evanidus* (Conch. Illus., fig. 139), New Holland.

The descriptions and figures are good.

When Reeve wrote his Monograph he doubtfully made the latter synonymous with the former, introducing as new species pl. xvii, sp. 104, *Chiton metallicus*, Australia, Mus. Cuming, and pl. xxi, sp. 142, *Chiton novæhollandiæ*, New Holland, Mus. Brit. Pilsbry made *evanidus* and *metallicus* synonymous with *australis*, writing: "The synonymy . . . is unquestionable," and giving as habitat "Port Jackson, Australia". *I. novæhollandiæ* was admitted as distinct from "Adelaide, S. Australia". Shells from the two localities named (New South Wales and South Australia) are very distinct. Recognition of two forms in Tasmania necessitated re-investigation, which revealed that the form recorded as "*australis*" from that locality had little to do with the typical Sydney shell. The description of *evanidus* gives as the salient features "central areas smooth in the middle, faintly striated at the sides; lateral areas rather elevated, with radiating granular *striae*". This disagrees with *australis*, but describes the eastern Tasmanian shell very exactly.

The north-west Tasmanian form differs in the absolute smoothness of its pleural areas and seems identical with the South Australian shells known as *I. novæhollandiæ* (Reeve). It is easy to separate these when series are compared, but individuals are not so clearly differentiated, and we are not certain about immature shells, the north-west form being apparently more elevated. However, the species of *Ischnoradsia* seem to have exceedingly narrow limits, so that for the present we may recognize two species in Tasmania. We make this observation because we have an undescribed species from Caloundra, Queensland, which is exceedingly like *evanida*, though the very different *australis* intervenes geographically.

#### 17. LORICA CIMOLIA (Reeve).

In the Conch. Icon. Chiton, pl. vi, sp. 31, fig. 31, February, 1847, Reeve figured and described *Chiton volvox* from specimens in the Mus. Cuming, collected at Sydney, New Holland, by Jukes. Later in the same work (pl. xxi, sp. 141, fig. 141, May, 1847) Reeve added *Chiton cimolius* from the same collection, the only locality given being Australia: he observed, "Allied in form, but not in sculpture, to the *C. volvox*; at a loss for a name, I have distinguished its resemblance in colour to the common fuller's clay." The differences are not clearly defined in the descriptions, but we note with regard to the former "ridges narrow, slightly waved, interstices peculiarly crenulately latticed", and to the latter "central areas smooth in the middle, ridged on each side, ridges thin, scarcely granulated, interstices hollowed".

In 1871 Angas, recording *Lorica angasi* from Port Jackson, commented (Proc. Zool. Soc. London, 1871, p. 97), "A species quite distinct from *L. cimolia*, Reeve, of which *L. volvox*, Reeve, is a synonym."

In the Man. Conch., vol. xiv, p. 237, 1893, Pilsbry accepted this synonymy, probably following Haddon (Rep. Zool. Res. Challenger, vol. xv, Polyp., p. 31, 1886), writing, "The differences



between *L. volvox* and *L. cimolia* are easily effaced when a good series is examined." He also suggested *Chiton rudis*, Hutton, as a synonym. Hutton's species was based on a specimen in the Colonial Museum, Wellington, New Zealand, supposed to have been collected in that country. This determination has been accepted by all workers since, Bednall, Suter, Torr, Thiele, and ourselves all passing this synonymy without question.

The consideration of the present collection necessitated a review, and with the types of Reeve's species, topotypes of the first-named species, South Australian specimens, and shells purporting to have been collected in New Zealand we find that *Lorica cimolia*, Reeve, is the name for the Tasmanian species, which differs at sight from the New South Wales shell in lacking the very distinct latticing between the longitudinal ribs of the central areas. The ribs are more distant and not so definite; the girdle-scales differ in size, and there are other minor differences. Basset Hull (Proc. Linn. Soc. N. S. Wales, vol. xxxv, 1910, pl. xvii, figs. 1, 2) gave illustrations of half-valves of the fossil *Lorica duniana*, n.sp., and the recent *L. volvox*, Reeve. Relying on the excellent illustrations, we cannot separate the recent Tasmanian and South Australian species from the fossil *L. duniana*, which would thus become a synonym of *L. cimolia*, Reeve. It may be possible later on to differentiate southern Tasmanian from South Australian shells, but typical *L. volvox* cannot be confused with either. The juveniles of the two species also show striking differences in many respects.

*Lorica* was reduced by Thiele to subgeneric rank under *Callistochiton*, *Loricella* and *Squamophora* being given similar rank. Thiele overlooked the fact that *Lorica* had priority, and that *Callistochiton* would be the name to suffer. We cannot see, however, that there is such a close relationship, and maintain all the groups with generic value and suggest later that they will not be closely associated. *Squamophora* seems very near to *Loricella*, but when the juveniles of *Lorica*, *Loricella*, and *Callistochiton* are compared little resemblance is found. With regard to the genus *Callistochiton*, we would note it has been badly handled in Australia. The generic (or family) characters have been taken as specific, and hence Torr recorded that he had traced *C. antiquus* from Queensland to West Australia. The northern Queensland shell differs from the Sydney one, which is easily separable from the South Australian form, which, however, may be the one inhabiting Bass' Straits, and may range to southwest Australia. The southern Tasmanian shell is, however, so very different that we are dubious of every record we have not personally investigated; and we note variation among unlocalized South Australian examples.

18. *CALLISTOCHITON MAWLEI*, n.sp. Pl. IV, Fig. 5.

Shell small, elliptic oblong, elevated, keeled, side slopes curved, valves not beaked. Colour orange-brown with distant dark-brown spots; girdle orange-brown tessellated with dark-brown stripes. Anterior valve with twelve distinct rounded radial ribs with deep

intervals, apparently smooth but under a good lens showing transverse scratches. Median valves with two similar ribs forming the lateral area; the ribs obsoletely scaled, probably due to growth, and sometimes appearing nodulose. Pleura longitudinally ridged, the ridges continuing over the jugum, about twenty to the half-valve, closer together as they reach the jugum, the interstices closely latticed. Tail-valve with mucro median, depressed, posterior slope convex. Anterior area sculptured as the pleura, posterior area as the anterior valve with nine ribs, scaly nodulose. Girdle covered with minute rounded scales, deeply grooved. The internal coloration white; teeth and slitting normal, but sutural laminae low and continuous, the sinus only showing as a slight curve.

Type from Port Arthur, southern Tasmania, collected by E. Mawle.

Length 17, breadth 9.5 mm. A larger specimen measures  $24 \times 12$  mm.

Range: southern Tasmania, collected by W. L. May, Dr. Torr, and E. Mawle.

Separable at sight from *C. antiquus* (Reeve) by the presence of the longitudinal ribs on the jugal area; a honeycomb structure occurs on the jugum of *C. antiquus* (Reeve), as here figured (Pl. IV, Fig. 5a') for comparison. Other differences exist in the keeling, size and shape of girdle-scale, elevation of mucro of posterior valve, and conclusively in the formation of the sutural laminae. These are continuous, whereas they are widely separated in the species *C. antiquus* (Reeve), and even more so in the South Australian species.

#### 19. SYPHAROCHITON MAUGEANUS, n.sp. Pl. V, Fig. 5.

Shell large, elongate oval, elevated, valves round-backed, beaked. Colour: blackish brown, with a black stripe down the jugum, succeeded on each side by a pale buff stripe, blotches of the latter colour also occurring on some of the sides of the valves. Anterior valve sculptured, with about sixteen ribs at the apex, divaricating so that over thirty can be counted at the edge; the ribs are cut by growth-lines into irregular nodules. Median valves with the lateral areas similarly sculptured, four primary ribs becoming six to eight at the edges; pleural areas sculptured with fine slanting longitudinal threads, becoming obsolete on the jugum; these are crossed by distinct growth-lines, which do not, however, cause nodules. Tail-valve with the mucro elevated at about the anterior third, posterior slope straight; sculpture on anterior portion like that on pleura of median valves; posterior portion sculptured like the anterior valve, twelve primary ribs being noted, and as many secondary ones. Internal features normal. Girdle covered with large round oval scales, finely striated.

Type from Port Arthur, southern Tasmania.

Length 52, breadth 31 mm. A large specimen measures  $61 \times 40$  mm.

Range: southern Tasmania.

The history of the genus *Sypharochiton* in Australia is complex. *Chiton pellisserpentis* was described in 1834 by Quoy & Gaimard from New Zealand. Gray in 1843 added another species, *Chiton*

*sinclairi*, also from New Zealand. In 1847 Reeve figured the latter species with the locality "Van Dieman's Land. Dr. Sinclair". In 1877 Tenison-Woods included this species in the Tasmanian census, but noted "Locality doubtful. N.Z. species". In 1893 Pilsbry included in the Manual *C. pellisserpentis* and *C. sinclairi*, but only gave for each the locality New Zealand. The next year Cox added Sydney as a locality for the former species, and later observed that he had specimens from Port Jackson which he took to be *C. sinclairi*. The same year Pilsbry stated he could not separate the Sydney shells sent him by Cox from Neozelanic specimens. In 1901 Tate and May replaced *C. sinclairi* by *C. pellisserpentis* on the Tasmanian list. In 1912 May and Torr write of *C. pellisserpentis* as "the commonest of all Tasmanian Chitons", while a similar shell is common in Port Jackson. The southern Tasmanian shells differ appreciably from Neozelanic shells in shape, elevation, sculpture, etc. In order to gauge the value of these differences we have studied Neozelanic shells from many localities from Auckland to Otago, and though we have observed variation we have not been able to confuse Australian with Neozelanic shells. Robin Kemp collected for one of us a long series of this genus in Sydney Harbour, and these are obviously separable from the Tasmanian shell and many of them suggest *C. sinclairi*. It is possible that there are two species of the genus also represented in Sydney Harbour, just as there appear to be two in South Tasmania. Certain shells have been found in the latter locality having the lateral areas as well as the pleural areas smooth. We have not yet fixed the status of this smooth shell. If it be an aberration of the present species it is unparalleled in the Neozelanic species, unless *C. torri*, Suter, be its equivalent. The question at once arises, should these be classed as sub-species or species? We have carefully considered this matter in connexion with southern Tasmanian shells, of which we have the following representatives: *Sypharochiton manganus*, Tas., and *S. pellisserpentis*, N.Z.; *Ischnochiton milligani*, Tas., and *I. proteus*, N.S.W.; *Ischnochiton decoratus*, Tas., and *I. crispus*, N.S.W.; *Callistochiton maulei*, Tas., and *C. antiquus*, N.S.W.; *Lorica cimolia*, Tas., and *L. volvox*, N.S.W.; *Rhyssoplax diaphora*, Tas., and *R. rugosa*, N.S.W., and others.

It is obvious that the last three could not be treated as subspecies, and in the case of *I. decoratus*, Sykes, we have three closely allied species living together, scarcely any more difference being observed than between the Tasmanian *I. decoratus*, Sykes, and the New South Wales *I. crispus* (Reeve). In the present case we have *S. pellisserpentis* (Q. & G.) and *S. sinclairi* (Gray) living together, and it is possible two pairs also occur together in Australia and Tasmania. Thus, while not dogmatizing, it seems best, until we know these faunas better, to treat each on its merits as specifically distinct, for to accurately settle the matter long series must be collected in many localities.

## 20. RHYSSOPLAX DIAPHORA, n.sp. Pl. V, Fig. 1.

Shell of full size for the genus, elongate oblong, narrow, slightly tapering at the posterior end, strongly elevated and keeled, side-slopes

straight, median valves beaked. Colour generally green, end-valves and lateral areas of median valves concentrically lined with white or pale greenish, dorsal area with dark-brown triangular patch, apex of triangle posterior, sides orange marbled; pleura green, with furrows in some cases blue-lined. In some specimens the orange marbling overruns the dark dorsal patch, and also extends on the pleura, the ribs becoming orange-brown. The general appearance is, however, more or less uniform. On the tail-valve there is a very narrow white patch, more or less triangular from the mucro to the girdle, where a broader and more extensive white patch is observed. Anterior valve very perpendicular, smooth. In senile shells an obsolete radial ribbing may be distinguished under a strong lens. Median valves have the lateral areas well raised and smooth, but in senile shells concentric growth-lines are prominent and obsolete radial ribbing is rarely present. The pleural areas are cut by longitudinal furrows which are distant and reach across the valve for half its height, fading away as the jugum is approached. In other words the pleura are sculptured with shallow ribs, a broad smooth triangle being observed on the jugum. In the type figured ten grooves can be counted on the half-valve, four of which extend across the valve; in the largest specimen sixteen grooves appear, seven extending across the valve. Tail-valve with the mucro elevated at the posterior third, the posterior slope slightly concave and smooth, the anterior area sculptured like pleural areas. Girdle-scales shining, obsoletely striate, and of varied colours. Rounded in shape, they are much smaller near the girdle-margin, and are largest in the centre of the girdle. Internal features typical of *Rhyssoplax*. Sinus very narrow. Colour inside pale blue-green with the sutural laminae white.

Type from Norfolk Bay, southern Tasmania.

Length 31, breadth 17 mm.

Range: southern Tasmania.

This shell has been known as *Chiton jugosus*, but it differs at sight from the typical Sydney shell in the pleural sculpture. It seems more nearly allied to *C. torri* = *torrianus*, Hedley & Hull, but it cannot be regarded as a subspecies thereof, nor can it be so classed in connexion with *R. jugosa*. We give diagrams of sections through the pleural areas of each species, taken at right angles to the girdle (Pl. V. Fig. 1a and a''). In South Australia there lives another species, classed as *C. jugosus*, which is nearer to that form, but it lives with *R. torriana*, and so complicates the matter. Moreover, the West Australian shell called *R. torriana* differs at sight from the South Australian species. Additional material is needed to accurately fix the status of these forms, but there is little doubt this shell is specifically distinct.

### III. GEOGRAPHICAL NOTES.

We have previously noted the importance of the *Chiton* fauna of Australia in connexion with zoogeographical problems, and have cited them in support of Hedley's theory of the Bassian Isthmus. The results of the present study are striking and such as we had not

